

Original Research Article

HOSPITAL-BASED SEROPREVALENCE OF HEPATITIS B SURFACE ANTIGEN AMONG PATIENTS ATTENDING A TERTIARY CARE TEACHING HOSPITAL IN UTTARAKHAND: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Hepatitis B virus (HBV) infection remains a major global public health challenge despite the availability of a safe and effective vaccine. Chronic HBV infection is a leading cause of chronic hepatitis, liver cirrhosis, and hepatocellular carcinoma. Although India is considered a country of intermediate HBV endemicity, considerable geographical variation exists and published epidemiological data from Uttarakhand remain limited, highlighting the need for region-specific hospital-based surveillance to guide prevention and control strategies. This study aimed to determine the hospital-based seroprevalence of hepatitis B surface antigen (HBsAg) among patients attending a tertiary care teaching hospital in Uttarakhand, North India.

Materials and Methods: A prospective observational study was conducted in the Department of Microbiology, Government Doon Medical College, Dehradun, Uttarakhand, from December 2023 to May 2024. A total of 17,131 patients of all age groups and both sexes who underwent HBsAg testing as part of routine clinical evaluation were included. Serum samples were tested for HBsAg using chemiluminescent microparticle immunoassay (CMIA). Initially reactive samples were retested in duplicate before being reported as positive. Data were analyzed using descriptive statistics, and HBsAg seroprevalence was expressed as frequencies and percentages.

Results: Among the 17,131 patients screened, 127 tested positive for HBsAg, yielding an overall seroprevalence of 0.74%. Of the seropositive patients, 70 (55.1%) were males and 57 (44.9%) were females. The highest proportion of HBsAg-positive cases was observed in the 21–30 year age group in both sexes.

Conclusion: The present study demonstrated a relatively low hospital-based seroprevalence of HBsAg among patients attending a tertiary care teaching hospital in Uttarakhand. Nevertheless, HBV infection continues to represent an important public health concern, particularly among young adults. These findings provide valuable baseline epidemiological data from Uttarakhand and support continued strengthening of hepatitis B vaccination, targeted screening of at-risk populations, infection prevention measures, and regional epidemiological surveillance to support progress towards the World Health Organization goal of eliminating viral hepatitis as a public health threat by 2030.

Keywords: Chemiluminescent immunoassay; CLIA; HBsAg; Hepatitis B virus; Seroprevalence; Uttarakhand.

INTRODUCTION

Hepatitis B virus (HBV) infection remains one of the leading causes of chronic liver disease worldwide and continues to pose a major public health challenge despite the availability of a safe and highly effective vaccine for more than four decades. HBV is a partially double-stranded DNA virus belonging to the family Hepadnaviridae and the genus Orthohepadnavirus. The viral envelope contains hepatitis B surface antigen (HBsAg), the earliest and most widely used serological marker for the diagnosis of active HBV infection. Persistent HBV infection can progress to chronic hepatitis, cirrhosis, hepatic decompensation, and hepatocellular carcinoma, resulting in substantial global morbidity and mortality.^[1]

According to the World Health Organization (WHO), an estimated 254 million people were living with chronic HBV infection in 2022, with approximately 1.2 million new infections and 1.1 million HBV-related deaths occurring annually, predominantly due to cirrhosis and hepatocellular carcinoma. Despite the availability of effective vaccines, reliable diagnostic assays, and potent antiviral therapy, only a fraction of infected individuals are diagnosed and receive appropriate treatment, thereby posing a major challenge to achieving the WHO hepatitis elimination targets.^[1,2] India is considered a country of intermediate HBV endemicity, although considerable geographical heterogeneity exists across different regions. The prevalence of HBsAg has been reported to vary from less than 1% to over 5% depending on the study population, healthcare setting, vaccination coverage, and regional epidemiological characteristics.^[3,4] Introduction of hepatitis B vaccination under the Universal Immunization Programme (UIP) and implementation of the National Viral Hepatitis Control Programme (NVHCP) have substantially strengthened efforts towards prevention, early diagnosis, and treatment of HBV infection in India.^[5]

HBV is transmitted through exposure to infected blood and body fluids by perinatal, percutaneous, sexual, and horizontal routes. Major risk factors include unsafe blood transfusion and injection practices, needle sharing among people who inject drugs, occupational exposure among healthcare workers, and unprotected sexual contact. Early identification of infected individuals through HBsAg screening facilitates timely clinical evaluation, counseling, linkage to care, antiviral therapy when indicated, and implementation of infection prevention measures, thereby reducing onward transmission.^[6]

In 2016, the WHO adopted the Global Health Sector Strategy on Viral Hepatitis, setting an ambitious target of eliminating viral hepatitis as a public health threat by 2030, including a 90% reduction in new infections and a 65% reduction in HBV-related

mortality. Achieving these goals requires robust epidemiological surveillance, early diagnosis, expanded vaccination coverage, and strengthening of healthcare systems. Reliable regional epidemiological data are therefore essential for monitoring progress towards these elimination targets.^[2]

Despite the national importance of HBV infection, published hospital-based epidemiological data from Uttarakhand remain scarce. Regional seroprevalence studies are therefore essential to characterize the local burden of disease, identify demographic patterns, and guide evidence-based screening, vaccination, and prevention strategies. With the above background, the present study was undertaken to determine the hospital-based seroprevalence of HBsAg among patients attending a tertiary care teaching hospital in Dehradun and to describe the age and sex wise distribution of HBsAg positive patients.

MATERIALS AND METHODS

Study design and setting: This prospective hospital-based observational study was conducted in the Department of Microbiology, Government Doon Medical College, Dehradun, Uttarakhand, India, over a six month period from December 2023 to May 2024. Government Doon Medical College is a tertiary care teaching hospital catering to patients from Dehradun district and adjoining regions of Uttarakhand. The study was undertaken to determine the hospital-based seroprevalence of HBsAg among patients undergoing routine laboratory investigations.

Study population: The study included 17,131 consecutive patients of all age groups and both sexes who underwent HBsAg testing as part of routine clinical care during the study period. Patients from outpatient departments, inpatient wards, emergency services, and other hospital units were eligible if HBsAg testing had been requested by the treating clinician. Duplicate samples from the same individual and haemolysed or inadequate specimens unsuitable for analysis were excluded.

Sample collection and laboratory testing: Approximately 5 mL of venous blood was collected aseptically in sterile plain vacutainers. After allowing the blood to clot, serum was separated by centrifugation according to standard laboratory protocols. Serum samples were screened for HBsAg using the ARCHITECT HBsAg Qualitative II assay (Abbott Diagnostics, Abbott Park, IL, USA), a chemiluminescent microparticle immunoassay (CMIA), on the Abbott ARCHITECT i1000SR immunoassay analyzer following the manufacturer's recommendations and standard laboratory procedures. Initially reactive specimens were retested in duplicate, and samples that remained repeatedly reactive were considered HBsAg positive for analysis. Internal quality control procedures were

performed in accordance with the manufacturer's recommendations before reporting patient results.

Data collection and Statistical analysis: Demographic variables including age and sex were extracted from laboratory records for all HBsAg positive patients. Continuous variables were summarized using descriptive statistics where applicable, while categorical variables were expressed as frequencies and percentages. Hospital-based HBsAg seroprevalence was calculated as the proportion of HBsAg-positive individuals among all patients screened during the study period.

Ethical considerations: The study protocol was approved by the Institutional Ethics Committee. Confidentiality of patient information was maintained throughout the study in accordance with the principles of the Declaration of Helsinki. The study has been reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

RESULTS

During the six-month study period, a total of 17,131 patients underwent HBsAg screening. Of these, 127 tested positive, yielding an overall hospital-based HBsAg seroprevalence of 0.74%, whereas 17,004 (99.26%) tested negative [Table 1]. Among the 127 HBsAg positive patients, 70 (55.1%) were males and 57 (44.9%) were females, corresponding to a male-to-female ratio of 1.23:1 [Table 2]. The age- and sex-wise distribution of HBsAg positive patients is presented in [Table 3], while the corresponding graphical illustration is shown in

[Figure 1]. Among male patients, the highest proportion of HBsAg positive cases was observed in the 21–30 year age group (23/70; 32.9%), followed by the 31–40 year and 41–50 year age groups, (17/70; 24.3%) cases. Similarly, among female patients, the 21–30 year age group accounted for the highest proportion of HBsAg positive cases (21/57; 36.8%), followed by the 51–60 year (12/57; 21.1%) and 41–50 year (10/57; 17.5%) age groups. Overall, irrespective of sex, the 21–30 year age group accounted for the highest proportion of HBsAg positive patients (44/127; 34.6%), followed by the 41–50 year (27/127; 21.3%) and 31–40 year (20/127; 15.7%) age groups. No HBsAg positive patient was identified in the 0–10 year age group.

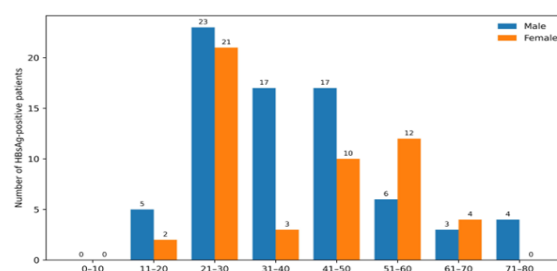


Figure 1: Distribution of HBsAg-positive patients according to age group and sex (n=127)

Footnote: The 21–30 year age group contributed the largest proportion of HbsAg positive patients in both males and females. No HbsAg positive patient was identified in the 0–10 year age group.

Table 1: Overall HBsAg screening outcome among patients attending a tertiary care teaching hospital in Uttarakhand (December 2023–May 2024)

HBsAg screening result	Number (n)	Percentage (%)
HBsAg positive	127	0.74
HBsAg negative	17,004	99.26
Total screened	17,131	100.00

Abbreviations: HBsAg; hepatitis B surface antigen.

Table 2: Sex-wise distribution of HBsAg-positive patients (n=127)

Sex	Number (n)	Percentage (%)
Male	70	55.1
Female	57	44.9
Total	127	100.00

Table 3: Age and sex-wise distribution of HBsAg-positive patients

Age group (years)	Male n (%)	Female n (%)	Total n (%)
0-10	0 (0.0)	0 (0.0)	0 (0.0)
11-20	5 (7.1)	2 (3.5)	7 (5.5)
21-30	23 (32.9)	21 (36.8)	44 (34.6)
31-40	17 (24.3)	3 (5.3)	20 (15.7)
41-50	17 (24.3)	10 (17.5)	27 (21.3)
51-60	6 (8.6)	12 (21.1)	18 (14.2)
61-70	3 (4.3)	4 (7.0)	7 (5.5)
71-80	4 (5.7)	0 (0.0)	4 (3.1)
Total	70 (100.0)	57 (100.0)	127 (100.0)

Footnotes: Percentages in the Male and Female columns are calculated within each sex category (Male, n = 70; Female, n = 57). Percentages in the Total column are calculated using all HBsAg-positive patients (N = 127).

Table 4: Comparison of the present study with comparable hospital-based HBsAg seroprevalence studies conducted in India

Study	State (Region)	Study design	Study period	Sample size	HBsAg sero-prevalence	Predominant age group	Male predominance
Jain <i>et al.</i> , 2024, ^[8]	Madhya Pradesh (Central India)	Hospital based	2018-2022	72,402	3.71	21-40 years	Yes
Singh <i>et al.</i> , 2021, ^[9]	Madhya Pradesh (Central India)	Hospital based	January-June 2021	10,972	2.05	31-40 years	Yes
Rahaman <i>et al.</i> , 2019, ^[10]	West Bengal (Eastern India)	Hospital based	January 2016-December 2016	10,802	2.92	Not reported	Yes
Goel <i>et al.</i> , 2026, ^[11]	Uttar Pradesh (Northern India)	Hospital based	January 2022-June 2025	73,018	2.58	21-30 years	Yes
Vedavati <i>et al.</i> , 2023, ^[12]	Karnataka (Southern India)	Hospital based	2021-2022	20,676	0.65	21-31 years	Yes
Present study (Negi <i>et al.</i> , 2026)	Uttarakhand (Northern India)	Prospective hospital based	December 2023-May 2024	17,131	0.74	21-30 years	Yes (55.1%)

Abbreviations: HBsAg; hepatitis B surface antigen.

Footnote: Variations in HBsAg seroprevalence among studies should be interpreted cautiously because of differences in study population, referral patterns, geographical region, study duration, healthcare setting, inclusion criteria, and laboratory diagnostic methods.

DISCUSSION

Overall HBsAg seroprevalence and comparison with previous studies: The present prospective hospital-based study evaluated 17,131 patients attending a tertiary care teaching hospital in Uttarakhand and demonstrated an overall HBsAg seroprevalence of 0.74%. To the best of our knowledge, this is among the few recent hospital-based studies describing the epidemiology of HBV infection from Uttarakhand and therefore provides valuable baseline epidemiological data for monitoring temporal trends and evaluating the impact of hepatitis B prevention and control programmes in the state.

The hospital-based HBsAg seroprevalence observed in the present study was lower than the pooled prevalence reported in earlier Indian systematic reviews, which estimated HBsAg prevalence to range between 2% and 4%, consistent with India's classification as a country of intermediate HBV endemicity.^[3,4,7] However, this comparison should be interpreted cautiously because the pooled estimates included heterogeneous populations comprising community-based surveys, blood donors, antenatal women, and other selected populations, whereas the present study evaluated consecutive patients attending a tertiary care teaching hospital.

A comparison of the present study with comparable hospital-based studies conducted in different regions of India is presented in [Table 4]. Considerable geographical variation in HBsAg seroprevalence was observed across these studies. Jain *et al.* from Madhya Pradesh reported an HBsAg seroprevalence of 3.71% among 72,402 hospital attendees, whereas Singh *et al.*, also from Madhya Pradesh, documented a prevalence of 2.05% among 10,972

patients.^[8,9] Similarly, Rahaman *et al.* from West Bengal and Goel *et al.* from Western Uttar Pradesh reported HBsAg seroprevalence of 2.92% and 2.58%, respectively.^[10,11] In contrast, Vedavati *et al.* from Karnataka reported an HBsAg seroprevalence of 0.65%, which closely resembles the 0.74% observed in the present study.^[12] Collectively, these findings highlight the marked regional heterogeneity in HBV epidemiology across India and emphasize the importance of region-specific epidemiological surveillance.

The comparatively lower HBsAg seroprevalence observed in the present study may reflect the cumulative impact of hepatitis B vaccination under the UIP, implementation of the NVHCP, mandatory screening of blood and blood products, improved infection prevention and control practices, safer injection practices, and increasing public awareness regarding viral hepatitis. Nevertheless, methodological differences among studies, including variations in study design, referral patterns, patient characteristics, healthcare settings, duration of surveillance, and laboratory diagnostic methods, should also be considered while interpreting these comparisons. Continued region-specific surveillance using standardized laboratory methods remains essential to monitor epidemiological trends and evaluate progress towards HBV elimination.

Sex-wise distribution of HBsAg positive patients: In the present study, males accounted for 55.1% of HBsAg positive patients, whereas females constituted 44.9%, resulting in a male-to-female ratio of 1.23:1. Similar findings have been reported in several hospital-based studies from India, including those by Jain *et al.*, Singh *et al.*, Rahaman *et al.*, Goel *et al.*, and Vedavati *et al.*, all of whom

observed a predominance of HBsAg positive males.^[8-12]

However, because the present study did not include the age and sex-wise distribution of the entire screened population, these findings should be interpreted as the distribution of HBsAg positive patients rather than sex-specific seroprevalence. Consequently, direct comparison of HBV prevalence between males and females cannot be made from the available dataset. Nevertheless, the relatively small difference observed between the sexes indicates that HBV infection continues to affect both males and females substantially. These findings reinforce the importance of gender-neutral preventive strategies, including universal hepatitis B vaccination, routine screening of individuals at increased risk of infection, and strengthening of infection prevention and control measures.

Age-wise distribution of HBsAg positive patients: The 21–30 year age group accounted for the largest proportion of HBsAg positive patients (34.6%), followed by the 41–50 year (21.3%) and 31–40 year (15.7%) age groups. A similar age distribution has been reported in several hospital-based studies from India. Jain *et al.* observed that most HBsAg positive patients belonged to the 21–40 year age group, while Vedavati *et al.* and Goel *et al.* likewise reported the highest frequency of HBsAg positivity among young adults.^[8,11,12] These observations suggest that HBV infection continues to predominantly affect individuals in the economically productive age group.

An encouraging finding of the present study was the absence of HBsAg positive patients in the 0–10 year age group. Although the present study was not designed to evaluate vaccine effectiveness and vaccination status was unavailable, this observation is consistent with the expected impact of childhood hepatitis B immunization under India's UIP. However, because the study was hospital-based and the number of children screened was not analyzed separately, this finding should be interpreted cautiously. Community-based studies incorporating vaccination history are required to determine the true burden of HBV infection among children in Uttarakhand.

Public health implications: Although the overall hospital-based HBsAg seroprevalence observed in the present study was relatively low, HBV infection remains an important public health concern because of its potential progression to chronic hepatitis, liver cirrhosis, and hepatocellular carcinoma.^[1,2] The predominance of HBsAg positive patients among young adults highlights the importance of strengthening routine HBV screening among individuals at increased risk of infection, including pregnant women, healthcare workers, household contacts of infected individuals, and patients undergoing invasive medical procedures, as recommended under the NVHCP.^[5,6]

The present study also provides valuable contemporary epidemiological data from

Uttarakhand, where published hospital-based information on HBsAg seroprevalence remains limited. Such regional data are important for monitoring epidemiological trends, evaluating the impact of vaccination programmes, identifying priority groups for targeted interventions, and supporting India's progress towards the WHO goal of eliminating viral hepatitis as a public health threat by 2030.^[1,2,5,13]

Strengths and limitations: The present study has several strengths. It included a large sample of 17,131 consecutive patients, providing a robust estimate of hospital-based HBsAg seroprevalence in a tertiary care setting. The prospective observational design ensured systematic data collection, while the use of CMIA enhanced the reliability of HBsAg detection. Importantly, the study contributes contemporary epidemiological data from Uttarakhand, where published hospital-based information on HBV seroprevalence remains limited.

The study also has certain limitations. Being a single-center hospital-based study, the findings may not be generalizable to the wider community. The analysis was restricted to HBsAg and did not include additional serological markers such as HBeAg, anti-HBc, anti-HBs, or molecular assays such as HBV DNA. Information regarding vaccination status, behavioral and occupational risk factors, socioeconomic characteristics, clinical diagnosis, liver function tests, antiviral therapy, and long-term outcomes was unavailable. Furthermore, because age- and sex-wise denominator data for the screened population were not available, age-specific and sex-specific prevalence rates could not be calculated. Future multicenter prospective studies incorporating detailed demographic, clinical, behavioral, and virological data are warranted to better characterize the epidemiology of HBV infection in Uttarakhand and other Himalayan regions.

CONCLUSION

The present prospective hospital-based study demonstrated an overall HBsAg seroprevalence of 0.74% among patients attending a tertiary care teaching hospital in Uttarakhand. The highest proportion of HbsAg positive patients was observed in the 21–30 year age group, with a modest male predominance among seropositive individuals. Although the observed hospital-based seroprevalence was lower than that reported from several comparable tertiary care centers across India, the findings reaffirm the considerable regional heterogeneity in HBV epidemiology and highlight the importance of generating region-specific epidemiological data.

The present study contributes valuable contemporary baseline data on hospital-based HBsAg seroprevalence from Uttarakhand, a region

where published epidemiological information remains limited. Continued implementation of universal hepatitis B vaccination, strengthening of the NVHCP, routine screening of individuals at increased risk of infection, adherence to infection prevention and control practices, and sustained epidemiological surveillance are essential to further reduce HBV transmission and support India's progress towards the WHO goal of eliminating viral hepatitis as a public health threat by 2030. Future multicenter, population-based studies incorporating detailed demographic, clinical, behavioral, vaccination, and virological data are warranted to further elucidate the epidemiology of HBV infection in Uttarakhand and other Himalayan regions.

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REFERENCES

1. World Health Organization. Hepatitis B. Geneva: World Health Organization; 2024 [updated 2024 Oct; cited 2026 Jul 15]. Available from: <https://www.who.int/news-room/fact-sheets/detail/hepatitis-b>
2. World Health Organization. Global hepatitis report 2024: action for access in low- and middle-income countries. Geneva: World Health Organization; 2024 [cited 2026 Jul 15]. Available from: <https://www.who.int/publications/i/item/9789240091672>
3. The Polaris Observatory Collaborators. Global prevalence, cascade of care, and prophylaxis coverage of hepatitis B in 2022: a modelling study. *Lancet Gastroenterol Hepatol*. 2023;8(10):879-907
4. Schweitzer A, Horn J, Mikolajczyk RT, Krause G, Ott JJ. Estimations of worldwide prevalence of chronic hepatitis B virus infection: a systematic review of data published between 1965 and 2013. *Lancet*. 2015;386(10003):1546-1555
5. Ministry of Health and Family Welfare, Government of India. National Viral Hepatitis Control Program: Operational guidelines. New Delhi: Ministry of Health and Family Welfare, Government of India; 2018 [cited 2026 Jul 15]. Available from: https://nvhcp.mohfw.gov.in/common_libs/Operational_Guidelines.pdf
6. Terrault NA, Lok ASF, McMahon BJ, Chang KM, Hwang JP, Jonas MM, et al. Update on prevention, diagnosis, and treatment of chronic hepatitis B: AASLD 2018 Hepatitis B Guidance. *Hepatology*. 2018;67(4):1560-1599
7. Batham A, Narula D, Toteja T, Sreenivas V, Puliyel JM. Systematic review and meta-analysis of prevalence of hepatitis B in India. *Indian Pediatr*. 2007;44(9):663-674
8. Jain RK, Shrivastava R, Jain SK, Chaurasia D, Jain A, Jain S, et al. Seropositivity and coinfection of hepatitis B and hepatitis C viruses in Central India: A hospital-based study. *J Fam Med Prim Care*. 2024;13(10):4413-4418
9. Singh B, Jayant S, Dehariya R, Poddar A, Bajpai T. Seroprevalence of hepatitis B virus infection in patients visiting a tertiary care hospital in Central India. *Int J Health Clin Res*. 2021;4(14):130-132
10. Rahaman J, Sengupta M, Barik G, Sarkar S, Sarkar R, Sengupta M. Seroprevalence and co-infection of hepatitis B and hepatitis C among patients in a tertiary care hospital in Eastern India. *J Assoc Physicians India*. 2019;67(9):27-29
11. Goel V, Singh K, Mohan S, Bansal J. Seroprevalence and coinfection of hepatitis B and hepatitis C viruses in Western Uttar Pradesh: A tertiary care hospital-based study. *Int J Health Sci Res*. 2026;16(2):94-98
12. Vedavati BI, Tabaseera N, Vathsalya MR, Attavar R. Study on seroprevalence of hepatitis B surface antigen among patients visiting a tertiary care centre. *Indian J Public Health Res Dev*. 2023;14(2):364-369
13. Premkumar M, Chawla YK. Chronic hepatitis B: Challenges and successes in India. *Clin Liver Dis (Hoboken)*. 2021;18(3):111-116.